



PHYSICO-CHEMICAL STUDIES OF FLUORIDE IN GROUND WATER OF FORBESGANJ BLOCK OF ARARIA DISTRICT (BIHAR), INDIA

Dr. A.K. Deo

Dept. of Chemistry, K.D. College, Raniganj (Araria)

ABSTRACT: A study has been under taken for the determination of Fluoride in drinking water at Forbesganj block (Araria). Fluoride was measured with the help of ion selective electrode. The Samples were collected from different sources of different locations throughout the year Feb. 2019 to Feb. 2020.

Keywords : Fluoride, Fluorosis, Ground water, Drinking water, Forbesganj.

INTRODUCTION

Water is one of the important factors for human life without which human cannot survive. Quality water is essential for human body. Water quality is influenced by various pollutants such as chemical, biological and physical elements. Excessive presence of water in bacteria, viruses, heavy metals, nitrates and salt etc. causes water pollution which adversely affects the human body.

One of the biggest challenges of the twenty-first century is to provide an adequate supply of safe-water for domestic consumption to all. But, the demand for water is increasing continuously. On the other hand, the quality of water resources, which is unevenly distributed on the surface of the earth, is getting worse due to anthropogenic activities. Therefore, even countries that have huge water resources available may face water scarcity in the near future. Due to the increase in the amount of soil pollution from municipal wastes, industrial wastes and heavy use of fertilizers and chemicals in agricultural land, the properties of groundwater have also changed simultaneously. Therefore, it is necessary to analyze groundwater to study the variation in quality standards.

Ground water sources such as hand pumps, wells and tubewells may contain excess fluoride where minerals like fluora-patite and cryolite are a present. About 95 percent of the fluoride in the body is found in bones and teeth/Fluoride is also essential for the normal mineralization of the bones and formation of dental enamel. Fluors-par-ore (CaF_2) is a major source of fluoride contamination in water and soil. Fluorspar occurs in many rocks in varied forms.

A permissible limit of fluoride concentration in drinking water as per WHO guidelines is up to 1.5 mg/L.

In this paper, the data pertaining to fluoride concentrations in the ground and surface water of Forbesganj Block of Araria district in Bihar state of India has been presented. For this, field samples from different sites were collected and analysed. The results obtained are presented and discussed in this paper.

GENERAL DESCRIPTION

Identity : Fluorine is a common element that is not found in primary state in nature due to its high reactivity. It is found in the earth's crust at about 0.3 g / kg and is present in many minerals as fluorides, of which fluospar, cryolite, and fluora-patite are the most common. The oxidation state of fluoride ion is -1.

Physicochemical Properties : Hydrogen fluoride (HF) is a colorless, pungent liquid or gas with a boiling point of 19.5°C that is highly soluble in water, and reacts with water to form hydrofluoric acid.

Sodium fluoride (NaF) is a colorless to white solid that is moderately soluble in water.

Fluorosilicic acid (H_2SiF_6), also known as hexafluorosilicic acid, is a colorless solid that is highly soluble in water.

Major Uses of Fluoride : Inorganic fluorine compounds are used for many purposes in industry. Such as aluminum production and flow in steel and glass fiber industries. They can be released to the environment during the production of phosphate fertilizers (containing an average of 3.8% fluorine), bricks, tiles, and ceramics. Fluorosilicic acid, sodium hexafluorosilicate and sodium fluoride are used in municipal water fluoridation schemes.

STUDY AREA

Forbesganj Block located in the south-east of Araria district of Bihar, between the longitudes of 75°27'35" to 76°56'48" East and latitudes of 23°45'20" to 24°52'17" North. In the present investigation, analysis of ground water samples of Forbesganj block in Araria district is presented. The Forbesganj block has 486,120 living in 97,526 houses, spread over a total of 2 towns, 108 villages and 33 panchayats and is one of the most densely populated areas in the north-west part of Araria district. Using this as a starting point, the researchers decided to test the quality of groundwater distributed in the Forbesganj block. He has studied the determination of fluoride in groundwater drinking water.

MATERIALS AND METHOD

The 217 samples of drinking water from different tubewells and wells from different location have been collected as directed by APHA. These samples were analysed at P.G. Department of Chemistry lab at D.S. College, Katihar by usual standard methods as prescribed by APHA. All chemicals used in this analysis were of A.R. grade.

RESULTS AND DISCUSSION

The results of different samples taken from about 31 villages of Forbesganj Block (Araria) are given in table below.

Table : Concentration of the fluoride in different samples

S. No.	Name of the Villages	Depth (feet)	F ⁻ (mg/L)
1	Matiyari	70	1.60
2	Bhattawari	76	1.40
3	Bhadreshwar	60	1.72
4	Rampur	40	1.69
5	Parwaha	42	0.28
6	Jhiruwa	40	0.56
7	Sirsia	55	1.70
8	Simraha	35	1.41
9	Dholbazza	35	0.94
10	Bhagkohaliya	60	1.69
11	Majhwa	65	1.95
12	Amhara	65	1.60
13	Ghoraghat	70	1.68
14	Ramai	60	0.97
15	Khabaspur	60	1.39
16	Thelamohan	45	1.98
17	Lahsunganj	45	1.29
18	Halhalia	40	1.00
19	Pipara	65	1.62
20	Garha	40	0.44
21	Bathnaha	45	0.47
22	K. Bajinathpur	50	1.65
23	Bheriyari	50	1.20
24	Potari	55	1.00
25	Balidih	65	1.02
26	Dumaria	40	1.57

From the above table, fluoride (F⁻) ion varied from 0.28 mg/L to 1.98 mg/L. Minimum 0.28 mg/L and Maximum 1.98 mg/L concentration of F⁻ were observed from Parwaha and Thelamohan villages respectively. Above table also clear that 12 samples out of 26 contain fluoride above the permissible limits of WHO i.e. 1.5 mg/L. In Forbesganj block 46.15 percent water samples have higher than 1.50 mg/L.

CONCLUSION

This study shows that the fluoride concentrations of about 46% villages groundwater samples analyzed are higher than 1.5 mg/L and up to 3.02 mg/L, which is much higher than the permissible limits prescribed by WHO. Due to high fluoride contents in potable water of investigated area, a large number of people are having known symptoms of dental fluorosis. Water in these villages of the study area is not suitable for domestic consumption without pre-treatment. Therefore a ground water management programme has been suggested.

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